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ENGELMANN SPRUCE SEED DISPERSAL INTO A CLEAR-CUT AREA

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In Engelmann spruce (Picea engelmannii Parry) stands, clear-cut areas greater than 20 chains wide may be too large to provide for prompt and adequate restocking. This tentative conclusion was reached after the first 5 years of a seed dispersal study at Falls Creek, Flathead National Forest, Montana.

An 18- by 30-chain clear-cut block, in which all unmerchantable trees had been felled, provided the study area. The long axis of the opening ran east and west across a 30- to 50-percent slope, while the short axis ran north and south along the slope. The south boundary (uphill side) bordered a mature, uncut timber stand, while the remaining sides bordered areas that had been clear cut but which still supported scattered, unmerchantable trees. Prevailing winds were mainly from the southwest.

In the summer of 1949 twenty seed traps were placed on each of two parallel lines, spaced 5 chains apart, running downhill across the width of the opening. The easternmost trap line (line A) was 11 chains from the east boundary, while the westernmost line (line B) lay 14 chains from the west boundary. Traps spaced at 1-chain intervals began 4 chains within the uncut timber and ran north 15 chains beyond the timber edge, to within 3 chains of the scattered trees on the north.

The first, second, third, and fifth seed crops occurring after installation of the traps were practically complete failures, but a good crop occurred in 1952 (the fourth year). Dispersal data obtained from the 1952 crop only are considered, since insignificant amounts of seed were caught in the other years. Seed dispersed from the 1952 crop were collected on October 15, 1952, and again on July 21, 1953.

Results

Fall of sound Engelmann spruce seed on the two trap lines averaged 953,000 per acre within the uncut timber, dropped sharply to about 70,000 per acre at 7 chains, and leveled off to a low of about 60,000 per acre at 9 to 11 chains from the uncut timber (figure 1). Beyond 11 chains seed fall increased slightly, apparently because of the approach to the scattered trees on the north. Seed fall on line B (westernmost line) averaged about 47 percent higher than on line A but the distribution pattern was similar. The higher catch on line B was probably due to more heavily stocked timber at its upper limits and to prevailing southwesterly winds.

Approximately 92 percent of the total crop was released prior to October 15, 1952 while the remainder fell after that date. Relatively fewer seeds released after October 15 dispersed as far as those which fell earlier in the season. For example, up to October 15, the amount of seed caught at 9 chains from the timber edge was 7 percent of that caught by the same date in the uncut timber. In contrast, the catch between October 15, 1952 and July 21, 1953 at 9 chains was only 2 percent of that in the uncut timber for the same period. Reasons for these differences in dispersal are unknown.

Discussion

Although 60,000 seeds per acre were dispersed as far as 9 chains from the nearest seed sources, it must be remembered that the 1952 crop was a good one, probably "bumper." If as few as 200,000 seeds had fallen in the uncut timber, the number dispersed as far as 9 chains might have been correspondingly less. Assuming similar weather conditions, one might estimate that, from the reduced crop, roughly 6 percent of 200,000 or only 12,000 seed per acre would have traveled as far as 9 chains from the source.

In addition to the size of the crop, quantities of seed required for adequate regeneration must be considered. Of course, amounts needed would depend largely upon soil surface conditions and other factors. Reliable information on the optimum number of seed required is not available for Engelmann spruce in this region. However, studies in larch--Douglas-fir stands in which Engelmann spruce is a component, indicate that on favorable seedbeds from 50 to 100 sound spruce seeds are required to establish one first-year seedling. Although based on results in a nonspruce type, this ratio may tentatively be considered satisfactory in applying results of the present study.

It may be concluded that seeds from the 1952 crop were dispersed in sufficient quantities throughout the 18- by 30-chain opening to provide for adequate regeneration, assuming favorable seedbed conditions. However, if the crop had been only fair or poor, dispersal would probably have been insufficient, and seed from additional crops would have been necessary to give satisfactory regeneration. These additional crops would be needed

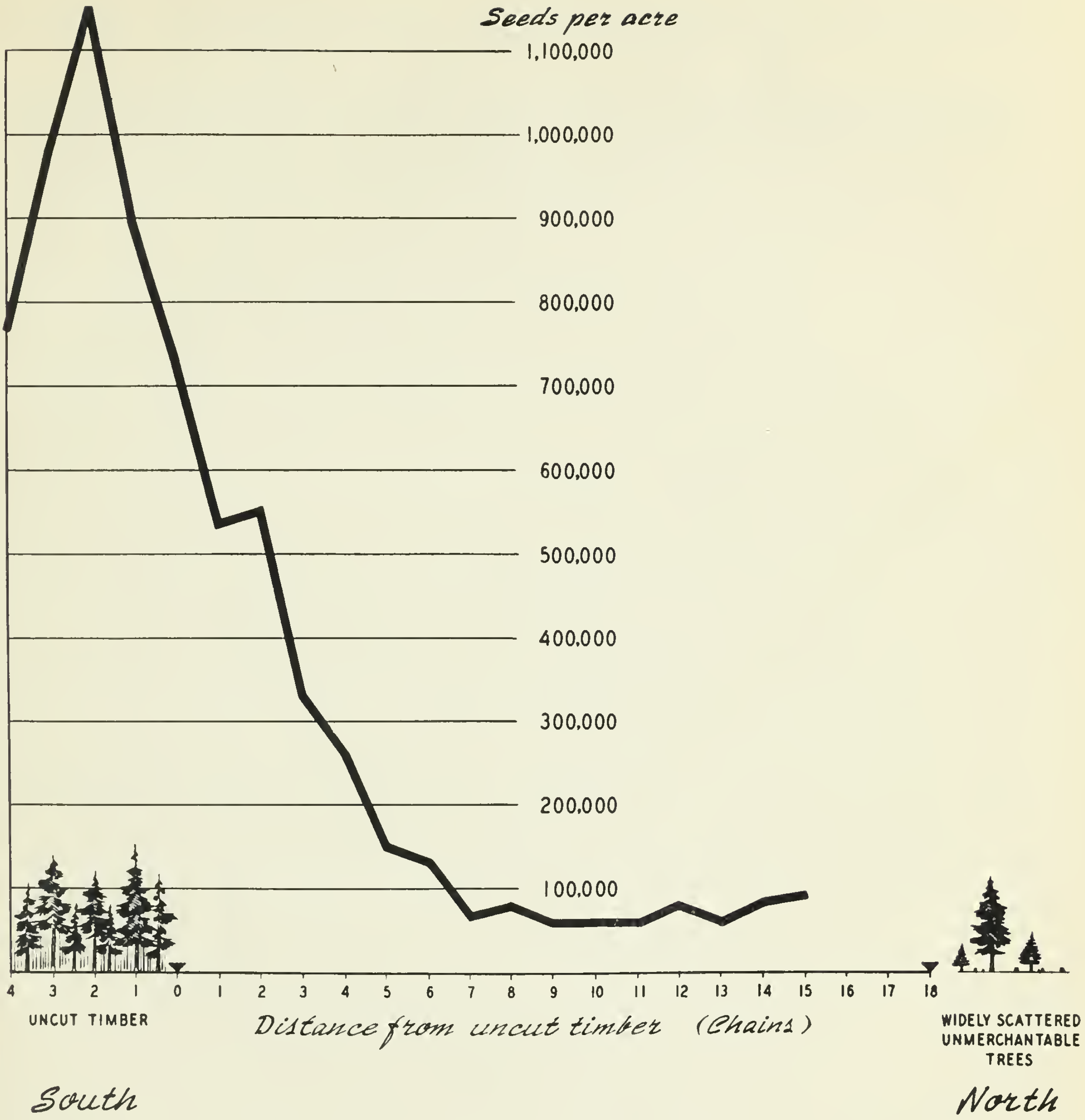

Figure 1. Dispersal of sound Engelmann spruce seed into a clear-cut opening; 1952 seed crop, Falls Creek, Flathead National Forest, Montana.

within a relatively short period of time following seedbed preparation, possibly 3 or 4 years, because of decreasing effectiveness of the seedbed.

Results for openings greater than 18 chains in width are speculative. The dispersal pattern obtained in this study, however, suggests that about 20 chains should be considered tentatively as a maximum width in planning the size of clear-cut blocks in Engelmann spruce.